

09864308
Notice of Allowability

Application No.

09/864,308

Examiner

Alexander Eisen

Applicant(s)

KUWATA ET AL.

Art Unit

2674

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Amendment filed on 4 April 2005.
2. ☒ The allowed claim(s) is/are 1-20,25-27 and 30-32, renumbered as 1-26.
3. ☒ The drawings filed on 22 August 2001 are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☒ None of the:
 1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|---|---|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 6. <input type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date _____ |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____ | 7. <input type="checkbox"/> Examiner's Amendment/Comment |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 8. <input type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9. <input type="checkbox"/> Other _____ |



Alexander Eisen
Primary Examiner
Art Unit: 2674

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Original): An image processing apparatus that carries out predetermined image processing of image data, which are to be displayed on an image display apparatus apparatus, and thereby generates supplied data to the image display apparatus,

the image display apparatus being a liquid crystal display apparatus that provides frame rate control-type tone display and has a less number of expressible display tones with regard to each pixel than a number of tones in the image data,

the image processing apparatus comprising: an input unit that inputs the image data;
and

a color reduction process unit that sets a display tone value, which is expressible by the liquid crystal display apparatus, with regard to each pixel, based on tone values of the image data,

wherein a range of the tone values allocated to each display tone value in at least either one of a high tone region and a low tone region by the color reduction process unit is narrower than that in an intermediate tone region.

Claim 2 (Original): An image processing apparatus in accordance with claim 1, wherein the color reduction process unit carries out a dispersion-type halftoning process.

Claim 3 (Original): An image processing apparatus in accordance with claim 1 further comprises an image data correction unit that carries out the correction that reduces a tone distribution in the intermediate tone region while enhancing tone distributions in both the low tone region and the high tone region.

Claim 4 (Original): An image processing apparatus in accordance with claim 1
further comprises:

storage means that stores therein a mapping of tone values of the input image data and
corrected tone values, and

an image data correction unit that refers to the storage means and corrects the tone
values.

Claim 5 (Original): An image processing apparatus that carries out predetermined
image processing of image data, which are to be displayed on an image display apparatus,
and thereby generates supplied data to the image display apparatus,

the image display apparatus having a less number of expressible display tones with
regard to each pixel than a number of tones included in the image data, giving output
lightness that varies stepwise against display tone value, and having a non-linear display
characteristic that provides the output lightness at varying intervals,

the image processing apparatus comprising:

an image data correction unit that carries out tone correction by taking into account
the non-linear display characteristic to enhance a tone distribution corresponding to an area of
wide intervals, while reducing a tone distribution corresponding to an area of narrow intervals
in a tone distribution of input image data; and

a color reduction process unit that divides a range of the tone correction into a preset
number of divisions and allocates tone corrected values in each division to each display tone
value according to a predetermined rule, so as to implement color reduction.

Claim 6 (Original): An image processing apparatus in accordance with claim 5, wherein the preset number of divisions is obtained by dividing the range of the tone, correction into substantially equal parts.

Claim 7 (Original): An image processing apparatus in accordance with claim 5, wherein the color reduction process unit carries out a dispersion-type halftoning process.

Claim 8 (Original): An image processing apparatus in accordance with claim 7, wherein the color reduction process unit carries out the dispersion-type halftoning process only when the image data is a specified type.

Claim 9 (Original): An image processing apparatus in accordance with claim 5, wherein the image display apparatus is a liquid crystal display apparatus applied for a cellular phone and implements frame rate control-type tone display.

17 ~~Claim 10~~ (Original): An image processing apparatus that carries out predetermined image processing of image data, which are to be displayed on an image display apparatus, and thereby generates supplied data to the image display apparatus,

the image display apparatus having a less number of expressible display tones with regard to each pixel than a number of tones included in the image data, giving output lightness that varies stepwise against display tone value, and having a non-linear display characteristic that provides the output lightness at varying intervals,

the image processing apparatus comprising:

a color reduction process unit that divides a range of tone values of the image data into plural divisions of varying widths corresponding to the non-linear display characteristic

and allocates tone values in each division to each display tone value according to a predetermined rule, so as to implement color reduction.

¹⁸
Claim ~~11~~ (Original): An image processing apparatus in accordance with claim ~~10~~,¹⁷
wherein the color reduction process unit carries out a dispersion-type halftoning process.

¹⁹
Claim ~~12~~ (Currently Amended): An image processing apparatus in accordance with
¹⁸claim ~~11~~, wherein ~~[[the]]~~ the color reduction process unit carries out the dispersion-type
halftoning process only when the image data is a specified type.

²⁰
Claim ~~13~~ (Currently Amended): An image processing apparatus in accordance with
¹⁷claim ~~10~~, wherein the image display apparatus is a liquid crystal display apparatus applied for
a cellular phone and implements frame rate control-type ~~tonedisplay~~ tone display.

¹⁰
Claim ~~14~~ (Original): An image processing apparatus in accordance with claim 5,
wherein the image data correction unit carries out the tone correction that reduces a tone
distribution in an intermediate tone region while enhancing tone distributions in both a low
tone region and a high tone region.

¹¹
Claim ~~15~~ (Original): An image processing apparatus in accordance with claim 5, the
image processing apparatus further comprising:

storage means that stores therein a mapping of tone values of the input image data and
corrected tone values,

the image correction unit refers to the storage means to correct the tone values.

¹²
Claim ~~16~~ (Original): An image processing apparatus in accordance with claim ¹¹~~15~~, the image processing apparatus comprising:

a plurality of the storage means are provided corresponding to a plurality of settings for a predetermined condition, the predetermined condition affecting the display characteristic of the image display apparatus; and

a storage means selection unit that selects one among the plurality of storage means, based on an input setting for the predetermined condition.

¹³
Claim ~~17~~ (Original): An image processing apparatus in accordance with claim ¹²~~16~~, wherein the predetermined condition is temperature around the image display apparatus.

¹⁴
Claim ~~18~~ (Original): An image processing apparatus in accordance with claim ¹²~~16~~, wherein the predetermined condition is brightness around the image display apparatus.

¹⁵
Claim ~~19~~ (Original): An image processing apparatus in accordance with claim ¹²~~16~~, wherein the image display apparatus is a liquid crystal display apparatus with a backlight, and the predetermined condition is brightness of the backlight.

¹⁶
Claim ~~20~~ (Original): An image processing apparatus in accordance with claim ¹²~~16~~, wherein the predetermined condition is a setting of a contrast adjuster that adjusts display contrast of the image display apparatus.

Claims 21-24 (Canceled).

²¹
Claim ~~25~~ (Original): An image processing method that carries out predetermined image processing of image data, which are to be displayed on a liquid crystal display apparatus, and thereby generates data that are supplied to the liquid crystal display apparatus, the liquid crystal display apparatus providing frame rate control-type tone display and having a less number of expressible display tones with regard to each pixel than a number of tones in the image data,

the image processing method comprising the steps of:

(a) specifying a display characteristic of the liquid crystal display apparatus of interest; and

(b) setting a display tone value, which is expressible by the liquid crystal display apparatus, with regard to each pixel, based on tone values of the image data, so that a range of the tone values allocated to each display tone value in at least either one of a high tone region and a low tone region is narrower than that in an intermediate tone region.

²²
Claim ~~26~~ (Original): An image processing method that carries out predetermined image processing of image data, which are to be displayed on an image display apparatus, and thereby generates supplying data to the image display apparatus, the image display apparatus having a less number of expressible display tones with regard to each pixel than a number of tones included in the image data, giving output lightness that varies stepwise against display tone value, and having a non-linear display characteristic that provides the output lightness at varying intervals,

the image processing method comprising the steps of:

(a) specifying a display characteristic of the image display apparatus of interest;

(b) carrying out tone correction by taking into account the non-linear display characteristic to enhance a tone distribution corresponding to an area of wide intervals, while

reducing a tone distribution corresponding to an area of narrow intervals in a tone distribution of input image data; and

(c) dividing a range of the tone correction into a preset number of divisions and allocating tone corrected values in each division to each display tone value according to a predetermined rule, so as to implement color reduction.

²³
~~Claim 27~~ (Currently Amended): An image processing method that carries out predetermined image processing of image data, which are to be displayed on an image display apparatus, and thereby generates supplied data to the image display apparatus, the image display apparatus having a less number of expressible display tones with regard to each pixel than a number of tones included in the image data, giving output lightness that varies stepwise against display tone value, and having a non-linear display characteristic that provides the output lightness at varying intervals,

the image processing method comprising the steps of:

- (a) specifying a display characteristic of the image display apparatus of interest; and
- (b) dividing a range of tone values of the image data into plural divisions of varying widths corresponding to the non-linear display characteristic and allocating tone values in each division to each display tone value according to a predetermined rule, so as to implement color reduction.

Claims 28 and 29 (Canceled).

²⁴
~~Claim 30~~ (Original): A computer program product that comprises a computer program carrying out predetermined image processing of image data, which are to be displayed on a liquid crystal display apparatus, the liquid crystal display apparatus providing

frame rate control-type tone display and having a less number of expressible display tones with regard to each pixel than a number of ~~tone~~, tones in the image data,

the computer program causing a computer to attain the functions of:

specifying a display characteristic of the liquid crystal display apparatus of interest;

and

setting a display tone value, which is expressible by the liquid crystal display apparatus, with regard to each pixel, based on tone values of the image data, so that a range of the tone values allocated to each display tone value in at least either one of a high tone region and a low tone region is narrower than that in an intermediate tone region.

25
Claim ~~31~~ (Original): A computer program product that comprises a computer program carrying out predetermined image processing of image data, which are to be displayed on an image display apparatus, the image display apparatus having a less number of expressible display tones with regard to each pixel than a number of tones included in the image data, giving output lightness that varies stepwise against display tone value, and having a non-linear display characteristic that provides the output lightness at varying intervals, the computer program causing a computer to attain the functions of:

specifying a display characteristic of the image display apparatus of interest;

carrying out tone correction by taking into account the non-linear display characteristic to enhance a tone distribution corresponding to an area of wide intervals, while reducing a tone distribution corresponding to an area of narrow intervals in a tone distribution of input image data; and

dividing a range of the tone correction into a preset number of divisions and allocating tone corrected values in each division to each display tone value according to a predetermined rule, so as to implement color reduction.

26

Claim ~~32~~ (Currently Amended): A computer program product that comprises a computer program carrying out predetermined image processing of image data, which are to be displayed on an image display apparatus, the image display apparatus having a less number of expressible display tones with regard to each pixel than a number of tones included in the image data, giving output lightness that varies stepwise against display tone value, and having a non-linear display characteristic that provides the output lightness at varying intervals,

the computer program causing a computer to attain the functions of: [[:]]
specifying a display characteristic of the image display apparatus of interest[[:]]; and
dividing a range of tone values of the image data into plural divisions of varying widths corresponding to the non-linear display characteristic and allocating tone values in each division to each display tone value according to a predetermined rule, so as to implement color reduction.

Claims 33-35 (Canceled).